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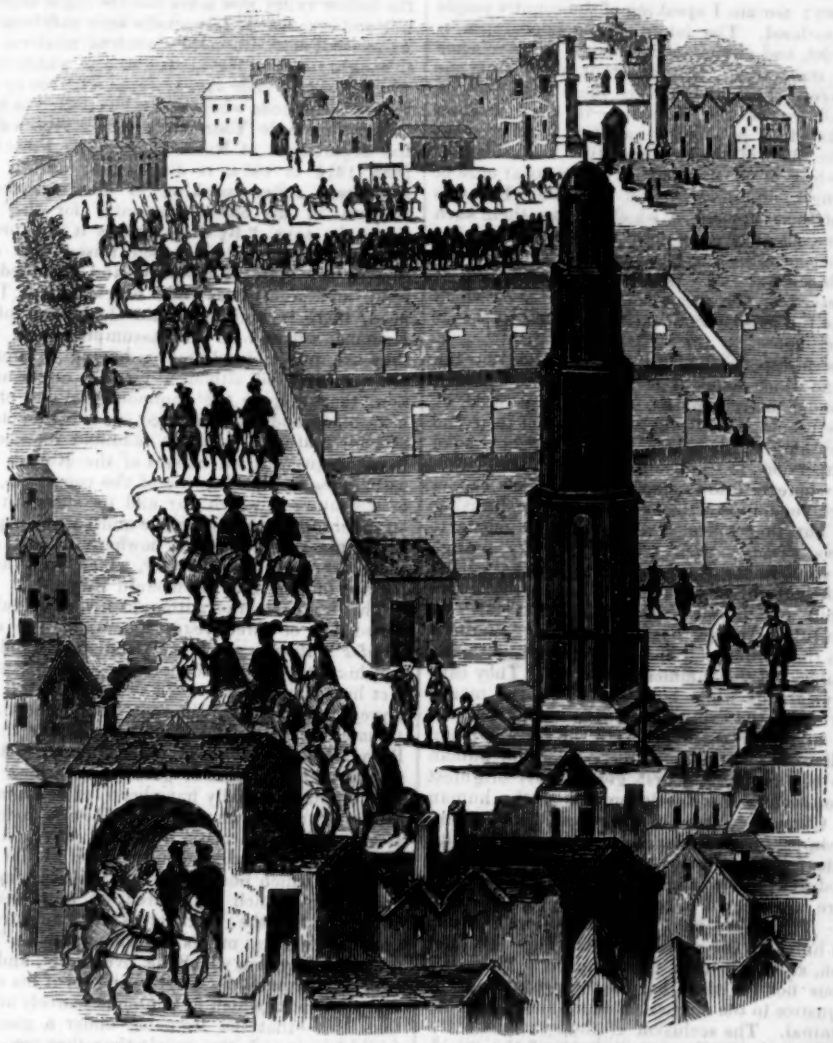
QUEEN ELIZABETH; HER PROGRESSES AND PUBLIC PROCESSIONS. No. IX.



COPY OF AN ANCIENT PRINT, REPRESENTING A ROYAL PROGRESS THROUGH THE STRAND.

PROCESSION THROUGH THE CITY FROM THE TOWER TO WESTMINSTER (*continued*)—HER MAJESTY'S CORONATION.

AFTER leaving the Conduit in Fleet Street, where, as we related in our last paper on this subject, Elizabeth was entertained with an appropriate pageant,—the fifth and last which had been prepared to dignify her passage through the city, the queen proceeded on her way towards Temple Bar. On reaching St. Dunstan's church she found the children of Christ's Hospital standing there with their governors; and perceiving that a child offered to make an oration to her, her grace "stayed her chariot, and did caste up her eyes to heaven, as who should saye, 'I here see thys mercifull worke towarde the poore whom I muste in the middest of my royaltie nedes remembre!' and so turned her face towards the child, and listened to an oration in Latin to this effecte:—

That after the quenes hyghnes had passed through the citie, and had sene so sumptuous, rich, and notable spectacles of the citizens, which declared their most heartie receiving and joyous welcomming of her grace into the same: thys one spectacle yet rested and remained, which was the everlasting spectacle of mercy unto the poore membres of Almighty God, furthered by that famous and most noble prince King Henry the Eight, her gracious father, erected by the citie of London, and advaunced by the most godly, verteous, and gracious prince, Kyng Edwarde the Sixth, her grace's dere and loving brother, doubting nothing of the mercy of the quene's most gracious clemencie, by the which they may not onely be releved and helped, but also stayed and defended; and, therefore, incessauntly they would praie and crie unto Almighty God, for the long life and raigne of her hyghnes, with most prosperous victory against her enemies.

When the child had ended his oration, he kissed the paper on which it was written, and delivered it to her Majesty, who received it graciously both by words and countenance, "declaring her gracious mynde towarde theyr reliefe." Hence she proceeded to Temple Bar, which was "dressed finelye with the two ymages of Gotmagot the Albione, and Corineus the Briton, two giantes bigge in stature, furnished accordingly." In their hands were a copy of Latin verses, summing up the designs of the preceding pageants; and in a smaller tablet was a copy of English to the same effect, as follows:—

Behold here in one view thou may'st see all that playne,
O princesse, to this thy people the onely stay:
What eche where thou hast seen in this wide town, again
This one arche whatsoever the rest conteynd doth say.

The first arche, as true heyre unto thy father dere,
Did see thee in the throne where the graund father satte:
The seconde did confirme thy seate as princesse here,
Virtues now bearing swaye, and vyces bet down flatte.

The third, if that thou wouldst goe on as thou began,
Declared thee to be blessed on every syde;
The fourth did open trueth, and also taught thee whan
The commonweale stood well, and when it did thence slide.

The fifth, as Debora, declared thee to be sent
From Heaven, a long comfort to us thy subjectes all;
Therefore go on, O quene, on whom our hope is bent,
And take with thee this wishe of thy towne as finall.

Live long, as long raygne, adourning thy countrie
With vertues, and mayntayne thy people's hope of thee;
For thus, thus Heaven is won; thus must you pearce the skye,
This is by vertue wrought, all other must nedes dye.

On the southern side "was appointed by the citie a noyse of singing children;" and there was one child "richely attyred as a poet," who delivered a farewell address to the queen in the name of the whole city, to this effect:—

As at thyne entraunce first, O prince of high renown,
Thou wast presented with tonges and heartes for thy fayre;
So now, sith thou must nedes depart out of this town,
This citie sendeth thee firm hope and earnest prayer.

For all men hope in thee, that all vertues shall raygne,
For all men hope that thou none errour wilt support,
For all men hope that thou wilt trueth restore agayne;
And mend that is amisse, to all good mennes comfort.

And for this hope they pray, thou mayst continue long,
Our quene amongst us here, all vyce for to supplant;
And for this hope they pray, that God may make thee strong,
As by his grace puissant, so in his trueth constant.

Farewell, O worthy quene, and as our hope is sure,
That into Errour's place thou wilt now Truth restore;
So trust we that thou wilt, so Soveraigne Quene endure,
And loving lady stand from henceforth evermore.

Our chronicler relates that while this address was being delivered, and "certeine wishes therein repeted for maintenaunce of trueth and rooting out of errour," the queen now and then held up her hands to heavenward, "and willed the people to say, Amen." And when the child had finished, her grace said, "Be ye well assured I will stande your good quene." She then departed through Temple Bar towards Westminster, "with no lesse shoutyng and crying of the people, then she entred the citie with a noyse of ordinance whiche the Toure shot off at her graces entraunce first into Toure-streate."

Thus the quenes hyghnesse passed through the citie, whiche without any forreyne personne, of itselfe beawtifyed itselfe, and receyved her grace at all places, as hath been before mentioned, with most tender obedience and love, due to so gracious a quene and soveraigne ladie. And her grace likewise of her side, in all her graces passage, shewed herselfe generally an ymage of a worthye ladie and governour; but privately these especiall poyntes wer noted in her grace as sygnes of a most princelyke courage, whereby her loving subjects maye ground a sure hope for the rest of her gracious duinges hereafter.

At the end of the contemporary account from which we have derived the details of Elizabeth's reception by the city on this memorable occasion, are added "certeine notes of the Quenes Majesties great mercie, clemencie, and wisdom, used in this passage." The first of them is thus related:—

Aboute the nether ende of Cornehyll towards Cheape one of the knightes about her grace had espyed an auncient citizen whiche wepte and turned his head backe; and therewith said this gentleman, "Yonder is an alderman (for he tearmed him) whiche wepeth and turneth his face backewarde: how may it be interpreted, that he so doth for sorowe or gladnes?" The Quenes Majestie heard him and said, "I warrant you it is for gladnes." A gracious interpretation of a noble courage which would turne the doutefull to the best. And yet it was well known that as ner grace did confirme the same, the parties cheare was moved for very pure gladnes for the sight of her Majesties person, at the beholding whereof he toke such comforte, that with teares he expressed the same.

In Cheapside the queen smiled, and being asked wherefore, she answered, "For that she had heard one say, 'remember old King Henry theyght.'" When it was mentioned to her that the city bore the whole cost of the pageants, &c., she said that it should not be forgotten—"whiche saying," continues our authority, "myght move all Englishemen heartelye to show due obedience and entiernes to their so good a quene, which will in no poynt forgeat any parcell of duetie lovingly shewed unto her." The affability of Elizabeth and her condescension towards poor persons upon this occasion, are the subject of especial notice.

What more famous thing doe we reade in auncient histories of olde tyme, then that mightye prynces have gentlye received presentes offered them by base and lowe personages? If that be to be wondered at (as it is passingly) let me se any writer that in any one prynces lyfe is able to recounte so manye presidentes of this vertue as her grace shewed in this one passage through the citie. How many nosegayes did her grace receive at poor womens handes: how ofttimes stayed she her chariot when she sawe any simple body offer to speake to her grace; a branche of rosemarye given to her grace with a supplication by a poore woman about Flete Bridge, was seen in her chariot til her grace came to Westminster, not without the marveylous wondring of such as knew the presenter, and noted the Quenes most gracious receiving and keeping the same. What hope the poore and nedy may looke for at her graces hande she can all her journey continuallye, so in her harkenyng to the poore chyldren of Christes Hospitall with eyes cast up into heaven, did fullye declare, as that neither the welthier estate could stande without consideracion had to the povertie, neither the povertie be duelye considered unles they were remembered, as commanded to us by Goddes owne mouth.

Two circumstances are noticed as especially indicating that the queen in all her doings showed herself most mindful of the goodness and mercy of God towards her. The first is her thanksgiving in the Tower before entering her chariot—an incident which is by some writers referred to her first entry within that fortress after her accession. Lifting up her eyes to heaven she said:—

O Lord, Almighty and everlasting God, I geve unto thee most hearty thankes that thou hast been so mercifull unto me as to spare me to beholde this joyfull daye. And I acknowledge that thou hast dealt as wonderfully and as mereifully with me as thou didst with thy true and faithful servant, Daniel thy prophet, whom thou deliveredst out of the denne from the crueltie of the gredy and rageing lyons: even so was I overwhelmed and only by thee delivered. To thee, therefore, onely be thankes, honour, and prayse, forever. Amen.

The other notable circumstance was her receiving of the Bible at the Little Conduit in Cheape, when she reverently took it with both her hands and

kissed it and laid it upon her breast, to the great comfort of the lookers-on.

For when her Grace had learned that the Byble in Englishe should there be offered, she thanked the citie therfore, promysed the reading thereof most diligentlye, and incontinent commanded that it should be brought. At the receit whereof how reverently did she with both her hande take it, kisse it, and lay it upon her breast, to the great comfort of the lookers-on. God will undoubtedlye preserve so worthy a prince, which at his honour so reverently taketh her beginning. For this saying is true and written in the boke of truth: "He that first seketh the kingdom of God shall over other things cast unto him."

Now, therefore, (concludes this interesting record,) all English hertes and her naturall people must nedes praise God's mercy which hath sent them so woorthy a prince, and pray for her grace's long continuance amongest us.

On the following day, being the 15th of January, 1559, Elizabeth was crowned in Westminster Abbey. From the palace she proceeded direct to Westminster Hall, in great state. First went the trumpeters, knights, and lords, heralds of arms, in their rich coats, then the nobles in their scarlet, and all the bishops in scarlet; and then came the queen and all the footmen waiting upon her. At the hall her grace's apparel was changed; and there she met the bishop who was to perform the ceremony, and "all the chappel, with three crosses born before them in their copes, the bishop mitred, and singing as they passed *Salve festa dies*." All the streets were newlaid with gravel and blue cloth, and railed in on each side. From the hall the queen proceeded to the abbey, where the coronation was performed by Owen Oglethorpe, Bishop of Carlisle, the only prelate who could be prevailed upon to undertake the office. The see of Canterbury was at this time vacant, Cardinal Pole, the last holder of it, having died in November, two days after Queen Mary; and the duty of performing the coronation devolved on the archbishop of York. Michael Heath, who then held that see, refused to assist in the office, as did all the other prelates, because Elizabeth had sufficiently declared her aversion to the church of Rome, both by proclamation and by admitting into her council men who had not the character of good catholics. Bishop Oglethorpe, however, was at last induced to officiate, notwithstanding the complaints of his brethren.

In Mr. Nichols's work is inserted from Ashmole's collections the following curious account of the *Cerymonies of the Coronacon of the moost excellent Queene Elysabeth.*

Item, fyrst her grace satt in a chayre of estate, in the middle of the church before the high aulter, and immediately her grace was conducted from the said chayre and lede between two lords to be proclaimed by a byshop, Queene of Inglande, at iiii placys, and the trompetts blowinge at every proclamacion. And immediately the Queen's Majestie was brought to the chayre of estate, and immediately hir grace was lede byfore the high aulter, and there sittinge a bysshop the Queenes Majtie kneeling before the bysshop and kissed the patyn, her grace offered money and the bysshop laid it in the basyne, and immediately offered a part of red sylke wherein the paten was covered. And immediately hir highnes sat in a chayre byfore the aulter, there being a bysshop in the pulpitt preaching a sermon byfore the Queenes Majtie, and all the lords spirituall and temporall. And after the sermon done the bysshop bade the beads her grace voyde out of the chayre knelynge and said the Lord's Prayer. And after that hir grace satt in hir chayre, and the bysshop gave her a booke, which she had, taking her oathe. And after that, the bysshop, knelynge byfore the aulter, red in two bookes, and hir grace gave a little booke to a lord to deliver unto the bysshop. And he received the booke. The bysshop retornyd the booke to the lorde, not reading the said booke and red other books. And immediately ye bysshop took the Queenes booke and red it byfore the Queene her grace. And after that hir grace kneeled byfore the aulter. And the bysshop red a booke byfore her grace. And immediately her grace went to shift her apparrell. And the bysshop sung the . . . . . of the masse in a booke which was brought in byfore the Queene, and then and there was a carpet with kussyns of golde spread before the aulter. And secretary Cycill delivered a booke to the bysshop, and there was a bysshop standing at the left hand of the aulter.

Item, the Queenes Majtie being new apparrelled came byfore the aulter and leand upon the kussene, and over her was spread a reed silken cloth. And then and there the bysshop annointed her grace. And yt done changing apparell her grace retorned and satt in her chayre. And there was a sword with a girdele putt over her, and upon one of her shoulders and under the other: and see the sword hangeing by her side. And after that two gartares upon her hands; and then one croune put the bysshop upon her hedde, and then trompetts sounding, and the bysshop put a ringe upon her finger, and delivered the septre in her hand, and then after the bysshop satt a croune upon her heed and the trompetts sounding. And after that her grace offered the sword and laid it uppon the aulter and retorned kneelinge. And the bishop readeinge upon a booke, and shee haveing the scepter and a crosse in her hand, and after that her grace retorned to the chayer of estate. And then the bysshop put his hand to the Queenes hand, and read certaine wordes to her grace. And then the lords went up to her grace kneeling uppon their knees and kissed her grace. And after the lords had done the bysshops came one after another kneeling and kissing her grace. And that the bysshop began the masse, the Queenes Majtie haveinge the septer in the right hand and the world in the left hand, the Epystel red fyrst in Latyn and after that in Inglish. And after that the bysshop brought her grace the Gospell, which also was read first in Latyn and after in Englishe: and shee kyssed the wordes of the Gospell. And immediately after her Majtie went to the offering, and byfore hir grace was borne iii naked swordes and a sword in the scabbard, and hir grace kneelyng byfore the aulter and kissed the patyn and offered certain money into the bassyn, and then and there was rede to her grace certaine wordes. And then hir grace retorned into her closett hearing the consecration of the masse and her grace kissed the pax. And when masse was done, her grace removed behinde the high aulter, and then and there her Majtie changed her apparrell, and so her Majtie was conducted from the Abbey to Westminster Hall and there dyned.

The hall was richly hung, and everything ordered in "such roiall manner as to such a regall and most solemne feast apperteined." In the mean time, while her grace sat at dinner, Sir Edward Dimmocke, knight, her champion by office came riding into the hall "in fair complet armor," mounted upon a beautiful courser "richlie trapped in cloth of gold;" and in the midst of the hall cast down his gauntlet offering to fight on the queen's behalf with whomsoever should deny that she was the righteous and lawful queen of this realm. The queen taking a cup of gold full of wine, drank to her champion, and sent the cup to him for his fee, together with the cover.

Now after this, at the serving up of the wafers, the lord maior of London went to the cupboard, and filling a cup of gold with ipocrasse, bare it to the Queene, and kneeling before hir took the assaie, and she receiving it of him and drinking of it, gave the cup with the cover unto the said lord maior for his fee, which cup and cover weighed sixteen ounces of Troy weight. Finallie, this feast being celebrated with all roial ceremonies and high solemnities due and in like cases accustomed, took end with great joy and contentation to all the beholders.

On the following day, the 16th, were great joustings at the tilt in honour of the coronation; there being four challengers, of whom the duke of Norfolk was the first. On the 17th there was tourneying at the barriers at Whitehall.

The study of truth is perpetually joined with the love of virtue; for there is no virtue which derives not its original from truth; as, on the contrary, there is no vice which has not its beginning in a lie. Truth is the foundation of all knowledge, and the cement of all societies.—Casuerba.

RECREATIONS IN NATURAL PHILOSOPHY.

No. IV.

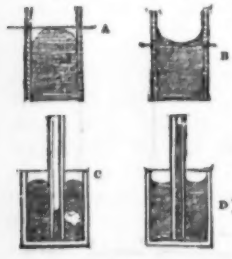
CAPILLARY ATTRACTION.

THE Latin word for a hair, such as the hairs of the head, is *capillus*, and a word derived from this has been applied to any tubes of which the bore is exceedingly small. When, therefore, any of our readers meet with the term *capillary* tube, they will understand that, although the term bears a very learned sound with it, yet it means nothing more than a fine hair-like tube. Glass tubes can be made less than one-hundredth part of an inch in diameter, and these are called capillary tubes. The term, however, is often applied to tubes considerably thicker than a hair.

Such tubes exhibit peculiar effects on liquids contained in them, and on liquids into which they are immersed. We all know that a liquid, under general circumstances, maintains a constant level at every part of its surface; and if we dip into a liquid a broad tube, open at both ends, such as a lamp-glass, the liquid will rise inside that tube to the same height as the level of the surface of the liquid outside, but no higher. These are circumstances with which we are so familiar, that we take no note of them; but when we thrust a tube of very small bore into a liquid, the liquid rises in the tube, but not always to the same height as the exterior surface of the liquid, sometimes higher, and at other times lower. The circumstance, or the property, which leads the liquid to rise to a greater or less height, is called *capillary attraction*; and the four little sections in fig. 1, will serve to illustrate different examples of this kind of attraction.

If we have two glass tubes, of equal size, A and B, which are stopped at the lower ends, and if we pour mercury, that is quicksilver, into A, and water into B, we shall generally find that the surface of the mercury in A will be round, or convex, or swelled upwards, as in the engraving, while the surface of the water in B will be sunken, or hollowed, or concave. Now this difference arises from the different way in which glass is affected towards the two fluids. Mercury and glass have a sort of repulsion for each other; they act as if they did not wish to come together. If we drop a little mercury on a piece of glass, it will not spread like water, but will remain as a small globe of mercury, so as to touch the glass as little as possible. Now it is for that reason that the top of the mercury in the tube is convex; the tube drives or repels the mercury from it, so that the latter is accumulated in a heap in the middle of the tube. A line drawn across the top of the little mound of mercury, shows how much it is depressed at the sides of that mound, on account of the repulsion of the glass.

Fig. 1.



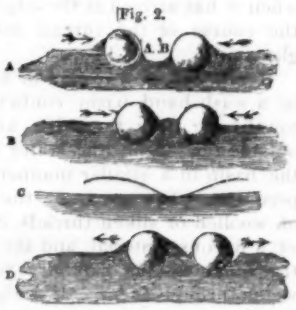
With the tube B, however, it is different. Water and glass have an attraction, or, if we may use the term, a liking for each other, and the glass draws the water towards it whenever an opportunity occurs. If we drop a little water on a clean piece of glass, it does not remain in globular drops like the mercury, but spreads out, as if to gain as large a surface of contact with the glass as possible. Now such is the case in the tube. The sides of the tube draw the water towards it all round, so that the centre is deprived of some of its water, and becomes depressed, or concave. If we draw a line across the centre of the surface of the water, we find that there is a considerable portion above the level, near the sides of the tube.

Suppose, now, that the tubes were a little larger than these, and that very small, or capillary tubes, were thrust down the middle of them, C will represent the effect when mercury is the liquid employed, and D when the liquid is water. If C be partly filled with mercury before the small tube is inserted, the surface will be convex, as before described; and on immersing the small tube, mercury will ascend into it, but not to the same height as the level of the mercury in the outer tube, and the mercury in both tubes will be convex at the surface. Here then we see that mercury, in accordance with the general principles that regulate liquids, ascends the inner tube, in order to gain the same level as the mercury in the outer tube; but it receives such a check from the repulsion which the glass manifests towards it, that it cannot attain that level, but remains at a lower level, as in the figure C.

Let us now turn to D. When water is poured into this tube, and the small tube immersed in the water, the water rises in the latter, not only to the same level as in the outer tube but still higher, while the surface of the water is concave, thus showing, in two different ways, an attraction between the glass and the water; for, after the water has ascended in the inner tube to the same level as in the outer, by the exercise of the ordinary property of liquids, it ascends still higher, by the attraction of the sides of the inner tube operating to draw it upwards. If the inner tube be not more than one hundredth of an inch in diameter, the water ascends, in this way, by capillary attraction alone, as much as four inches.

In fig. 2, we have the same facts proved by a different mode of illustration. Let A represent water, and A B two small balls, (made of any solid material which can be wetted by water,) placed upon the liquid surface, or suspended so as to touch and sink a little below such surface. When the balls are placed near each other, there will be a hollow, concave space between them, formed by the depression of the water, as shown at A B in the figure, and resembling the concave at B and at D in fig. 1. If now, by means of a feather, we wet the parts of the balls near the arrows, the water will flow up above the level, in the direction of the arrows, and wet the balls nearly to the top. If we move the balls nearer to each other in the direction of the arrows, the concave space between them will become more hollow.

Fig. 2.



In B, fig. 2, we have mercury, into which the balls are partly depressed, and the space between them then becomes convex, as in A C, fig. 1. If we move the two balls nearer together, the mercury between them becomes more convex.

C, fig. 2, represents the curve formed by the balls and the water; the former not being shown in the figure, in order to give a general view of the disturbance of the liquid surface, and its elevation above the liquid level.

In D, fig. 2, we have an interesting variation of A. One ball is completely wetted, and water rises up all

over it, producing a general elevation above the level of the liquid; the other ball is kept perfectly dry, by giving it a slight coating of grease or of varnish, and in this condition it repels the water around it, and produces the hollow, or depression, as shown in the figure. If the balls be moved along in the direction of the arrows, an elevation and depression will accompany them in the same manner as if they were stationary. We see, then, that, if one of the balls be kept dry, and the other allowed to get wetted, the water will rise up round the latter, and be depressed round the former.

Did any of our younger readers ever consider, how it is that the oil in our lamps becomes consumed? We put oil into a hollow case, and attach a wick of cotton, which partly dips into, and partly rises, above the surface of the oil, but we apply a light to the wick at some distance above the cistern of oil; how then does the oil ascend? We may reply, that if there were no such thing as capillary attraction, our lamps would be of no use to us whatever. Oil, like other fluids, has, in general, no tendency to ascend, and it does so in this case only on account of the peculiar attraction, of which we are now speaking. The wick consists of several filaments of cotton-thread, loosely twisted together, and in this form the intervals, or interstices, between them act like capillary tubes, up which the oil ascends. If we put a new wick and a new supply of oil into a lamp, we shortly see the upper extremity of the wick wet with oil; for it has ascended through the little channels between the filaments of cotton. As the oil burns away in the form of flame, more oil ascends through the wick, and thus a supply is kept up.

If we fill a glass-tumbler with water, and put one end of a skein of thread, or of a wick of cotton, into it, and let the thread hang over the edge of the glass, so that the other end shall be outside, the glass will be entirely emptied. The little filaments carry up the water in minute streams and channels, and when it has arrived at the edge of the glass, it follows the course of the thread down the outside of the glass.

If one end of a towel, or handkerchief, be placed in a wash-hand basin containing water, and if the towel hang over the edge, and have the other end outside the basin, the water will be conveyed from the basin in a similar manner to that in the last experiment. The towel, or the handkerchief, is made of woollen or silken threads, each of which is formed of a fibrous material, and the minute spaces between the fibres act as capillary tubes, and conduct the water through them. If a skein of cotton or of silk be placed partly into a glass-tumbler full of water, and the other part be placed in an empty tumbler near the first, the water will flow from the first into the second glass, until it is at the same height in both.

If we take a small square of glass, and dip it edgeways into a basin of water, we shall see that the water will slightly rise at the surface of the glass, but in so small a degree as to be hardly perceptible; but if we have two squares of glass, and place them face to face, but not absolutely touching, and then dip their edges into water, we shall find that the water will rise between them to a perceptible height: we have, in fact, a broad, flat, capillary tube, up which the water ascends. But the most pleasing way of producing this result is to place the pieces of glass in contact at one of their upright edges, and to let them gradually open towards the other upright edge. The water will then ascend to different heights between the plates, being highest at that side where the glasses are in contact.

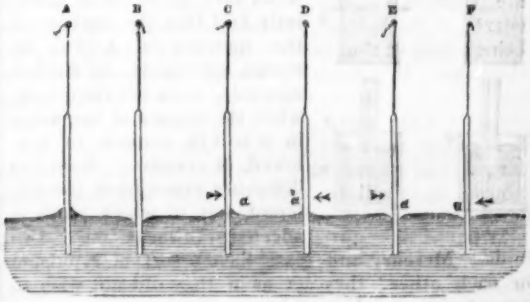
Fig. 3 may illustrate this. We have here two pieces of glass connected by hinges at the left edges, while the opposite edges are clasped by an instrument which allows us to vary the distance of the two plates: when the plates are a little opened at the edges, they are then in the condition of a book very nearly closed. If now the lower edges be dipped in water, the water will ascend to a considerable height near the hinges, and to a gradually decreasing height as we go from those edges to the edges which are a little opened. The water forms a curved line, called a *hyperbola*, which is represented by the darker lines of the figure. This experiment is more pleasing and striking if coloured water be employed. For this purpose we may drop some red or black ink into the water.

Fig. 3.

The means by which we know whether or not a solid and a fluid exert this sort of attraction on one another is by observing whether the fluid wets the solid, on immersing the latter in the former and drawing it out again. When we dip a piece of glass into water, and take it out again immediately, the glass is wetted, which is but another mode of saying that the glass has attracted the water. But if we dip the piece of glass into mercury, and take it out again, we find that the glass is not wetted: no mercury adheres to it, because mercury and glass do not attract each other. Also if we grease the glass, water will not adhere to, or be attracted by it.

The effect of attraction and repulsion, exerted in this way may be further illustrated by fig. 4. Suppose

Fig. 4.



we have water in a vessel and have plates of different substances suspended by threads: and suppose some of the plates have the property of attracting water, and others the property of repelling it. The left-hand figure A will represent the effect of dipping into the water a plate which attracts it: the water is raised a little on each side of the plate. The next adjoining one, B, is a plate having a repulsive tendency; so that on dipping it into the water, a depression is seen on each side of the plate.

Suppose now that we have two plates of the former, *i. e.*, the attractive kind, and that we dip them into the water near each other, as at C and D. There is, then, an elevation of water on each side of each plate, and as the plates are drawn nearer together, in the direction of the arrows, the surface of the water between them gradually assumes a concave form, which becomes more decided as the plates approach each other.

Lastly, if we have two plates with what we will call

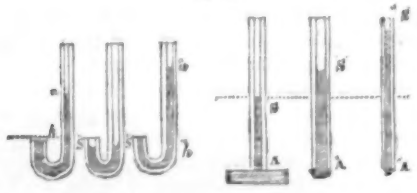
the repulsive tendency: on dipping them in near each other, as at E and F, the liquid is depressed at those two points; and on making the plates approach each other, the surface of the water between them will become more and more convex. If two dissimilar plates, such as D and E, be used, the water will rise round one and sink round the other.

We may frequently see that if a lump of white sugar be placed on a wet part of the table, the whole lump will become wetted. We may take a little water in a tea-spoon, and place a lump of sugar in it, when we shall see the water gradually rising through the sugar, until the latter is all wetted. This is wholly caused by capillary attraction. The sugar is full of minute pores, through which the water ascends. If water coloured with red ink be employed, the experiment becomes more pleasing.

The same may be said of a sponge. If we place the lower part of a sponge into water, the whole of the sponge becomes speedily wetted, by the ascension of the water through the little channels which pervade the sponge in every direction.

If we observe the mercury in a barometer, its surface is sometimes flat, sometimes convex, and sometimes concave. It is convex when rising, concave when sinking, and flat when it has just begun to sink. These various appearances greatly influence the observer in predicting any changes in the weather.

Fig. 5.



The various appearances of liquids in capillary tubes are collected in fig. 5. The first three tubes are curved at the bottom, the first tube is of unequal bore, being wider at the level *h* than in the straight part of the tube. If mercury be poured into it, the fluid will rise considerably above its level: it will rise to *a*, and form a convex surface. In the second tube the mouth S is wider than the straight tube, and the latter is larger than an ordinary capillary tube. If water be poured in, it will be concave at S, and rise in the straight part of the tube to S′, where it is also concave. But if the straight part of the tube be capillary, the water will rise up to *a*, as in the third tube, and its surface will be concave. The three straight tubes represent the elevation of different liquids above the level of the liquid into which they are plunged. The first straight tube represents one end in water, and the level at A is raised to S in the tube: the second straight tube represents a tube lifted out of the water, and the formation of a drop of that fluid at the bottom part of the tube: this drop is formed by the attraction of gravitation, which draws all bodies down to the earth; but in this case the drop will not fall, because the capillary attraction is superior to that of gravitation. In the third straight tube the level S is higher than in the other cases, because the tube is supposed to be narrower.

Capillary attraction is of vast importance in nature. By its means the sap ascends in trees, and at some seasons of the year the force of the ascent is so great that if a bough be cut off, from a vine for example, and a bladder be firmly tied to the mutilated stump, it will in a few hours become full of sap, and even burst if not removed. It has been remarked that timber trees which are cut during spring or summer, when the sap is in action, yield very bad timber, which would have been good if cut in the winter: the reason probably is that the sap decomposes, and thus injuriously affects the wood. Capillary attraction also influences the distribution of the animal fluids; and it extends its influence over mineral bodies, and greatly assists in their decomposition, and in the formation of soils. We see then that a small force, which is almost unnoticed and unknown by the great mass of mankind, becomes, when developed by the inquiries of science, one of the most important processes in the three kingdoms of Nature.

COTTAGE GARDENING.

IT is hardly possible to conceive that any one can travel through this country, without observing the number of gardens by the road side, cultivated by the extra industry of the humble tenants of the road-side cottages. The increase of these little allotments, considerable of late, can scarcely have failed to impress on any one the important addition these small plots give to the beauty of the scene. In a rich and populous country like England, it is in vain to look for the grander beauties of rugged and untamed nature. A traveller, amidst the scenes of English wealth, must rather expect to see moral beauty derived from proofs of order and industry, and from the evidence which these offer, of the comfort and the well-doing of the numerous human beings that meet his view, even in the most sequestered hamlets of this island.

If a traveller, as he passes along, is delighted with the appearance of a well-trimmed hedge, small crops of vegetables regularly planted, well and cleanly kept,—if he sees in them a promise of many a comfortable and wholesome meal to reward the care and industry of the humble owner of these riches, he will no less enjoy, likewise, the small plot of flowers, for simple ornament. The pendant honeysuckle with its fragrant flowers, or the rose-bud with its tufted blossoms, will delight, not his senses of sight or smell alone, but must carry him on to reflections still more gratifying than those mere senses can afford.

It is impossible not to draw from sights like these, a conviction of the comforts of his poorer brethren, of the pleasure which the simplest and most innocent sources of enjoyment are yielding them. These crops of useful and ornamental vegetation, declare that the owners, however humble be their lot, are not struggling through ill-requited toil, in the midst of penury, distress, and starvation, without enjoyments which they share with their wealthier neighbours; and greatly is it to be desired, that all such should be ready to recompense these cottagers for the cheap, yet real pleasure, that the view of the gardens afford them. The means of recompense are within the reach of every one. Let every one encourage and spread the love of gardening, till not a single person exists, willing to occupy his spare time in this way, unable to find something on which to bestow his care; and so withdraw him from amusements that, far from bettering his condition, degrade his moral and religious character, and diminish his means of present comfort and advancement.

If cottage gardens administer pleasure to travellers, or country residents, do those whom inclination or necessity lead to the more crowded haunts of the metropolis, or of our manufacturing or commercial towns, derive less gratification from the view of the pots of beautiful and gaudy flowers, with which, in many instances, the humblest dwellings are orna-

mented? Let any one who really feels an interest in the welfare of a human being, however lowly may be his condition, step in to such a dwelling: let even a lady do so, she *may* do it confidently. In such a dwelling, she will find nothing to shock, or to alarm, the most sensitive delicacy, the most refined sensibility;—but she will be most unfortunate, indeed, if upon the testimony of these silent witnesses, she does not find that neatness, order, cleanliness, comfort, and civility too, are the inmates of such dwellings. If, then, such be the almost insensible but certain effects of these harmless engagements, why does not every one encourage them? Why does not every one labour to promote so cheap, so innocent, so beneficial a pleasure? And every one, at the expense of a very little trouble, can do so. The modes in which each may do so are various: one may grant land; and let it be remembered that the most sterile bit of soil, in careful hands, will soon lose its barren character, and the great object in view will probably have been attained by the occupier in the course of that change.

In farms or gardens which are to furnish a livelihood for the occupier, the goodness of the soil, which will influence the price of the product, must be considered; in the present case we look for another kind of product, we look for health, for recreation, for innocent employment after the weightier occupations of daily toil. The production, then, of the soil, is here only a secondary matter. But even the barren spot does not belong to all persons; yet such as cannot add to the number of small gardens, may contribute from their own, or their friend's gardens, something towards improving the beauty, or the value, of those that belong to their poor neighbours. A few seeds, or a cutting of a plant, a few grafts of a valuable fruit-tree, or some buds, cost the possessor nothing, but, in truth, extend the gratification of his taste for the beauties of nature, by enabling him to see to the right and left those splendid productions of the vegetable world, which, but for such cheap though real kindness, must continue to be confined to his own domain.

Still if this is beyond the power of any individual, there are other means of advancing this good work, by the encouragement to be held out to small gardening efforts, by supporting Horticultural Societies and Exhibitions. These have become very numerous, and many, if not most of them, offer prizes to cottage productions,—vegetables, fruit, and flowers; several add prizes for instances of combined skill and industry in the cottages and gardens themselves. It is greatly to be wished, that these Societies were spread all over the country. No one who has not witnessed it could guess the important influence which these Societies exert upon the condition of the labouring poor, and he has only patiently to continue his exertions for a few years, and we are much mistaken if he will not begin to see his care and labour well recompensed by the silent, though sure, advancement of industry and comfort, and their certain attendants, sobriety and contentment. It has frequently been the lot of the writer of the present remarks to be asked, in a tone of peevish discontent, "What is to be done for the benefit of the poor?" To answer such a question fully, would require more space and time than could now be given; but whoever is really anxious for the information, may be assured that, until he has promoted, as far as possible, cottage gardening, he has not employed one of the simplest, readiest, and most effectual means of benefitting his poorer neighbours. The culture of flowers will prove no less *morally* useful than that of vegetables will, in a pecuniary point of view, be valuable. Even in the closest cities and towns, a love for, and skill in, raising a few geraniums or myrtles, or such other exotics as require pots, may be exerted for the ornament of the window of the lowliest residence, and by adding to the charms of home, retain many who would otherwise be wanderers from their own dwellings, to pass their time in beer-shops or pot-houses.

B.

AN INCENTIVE TO THE STUDY OF BOTANY.

The vegetable creation, although inanimate, contains notwithstanding infinite beauty and perfection; and the more closely we inspect it, the more are we able to admire it, and to adore the wisdom of that Almighty Power which produced it. Nor are we to suppose, that man is to remain satisfied with the knowledge of the nature of this or that particular plant, simply because it is for his own immediate benefit. Far from it; on the contrary, it is our duty to have some knowledge of all God's works, as in them we can discover his wisdom and omnipotence. But, independently of this higher motive, we should think that the pleasure, much more the advantage, to be derived from such knowledge, would be a sufficient inducement. But there are some who would start the objection, that there are so many difficulties to obstruct their progress, as would render it useless for them to attempt it. The only answer we would give to such objections, as being an all-sufficient one, is that the study of botany is by no means difficult, as we hope we shall be able to show, to the satisfaction of our readers.

As the difference of the formation of various plants, or, in other words, the manner of classing them is the first step, we shall confine ourselves to that part only, feeling assured, that when our reader has proceeded so far, the pleasure he has derived from it will induce him to proceed to the minutiæ of botany. He must first then learn what are the several parts of a plant, as it is by the peculiar form or number of those parts, that we are able to assign a name to any plant. Our next lesson must be the different divisions into which all plants may be divided, viz., classes, orders, genera, and species. Having learnt this, we must proceed to discover the method of placing any plant in its particular class, order, &c., or, in other words, of naming it. We find that this is done by knowing the characteristics of the plant, and that the stamens are the index, as it were, of the class, the pistils of the order, and other peculiarities, such as the shape and colour of flower, or leaf, &c., of the genus and species; so that having found out all this, we are able, by this easy process, to discover what before seemed to us so difficult, viz., how to name any plant. But to take an example.

There are few who, in their walks over any sandy common, have not observed a little, blue flower, growing at their feet, almost inviting attention by its beauty and elegance, but we fear that there would be few who would feel curious about the name of that little flower; but we will not condemn our reader, but, on the contrary, suppose his attention to be arrested, and his curiosity excited. He plucks the little flower, intending on his return home to examine it and investigate its name. Knowing that the stamens designate the class, and the pistils the order, he proceeds to examine his flower, and finds that it has two stamens only. He is then sure that the plant belongs to some class or other, which is distinguished by having two stamens only, which

he finds to be *Diandria.* So that now, instead of having the whole range of botany before him, he is able to limit his search within the bounds of the class *Diandria.* He then resumes the examination of the flower, and finds that it has only one pistil, by which he knows that it belongs to the order *Monogynia.* But he still finds that this order has various genera, and upon further examination of his flower, he finds that it answers to the description of the genus *Veronica,* so that he has now found the class, order, and genus of the plant; but he has yet to find to which particular species of the order *Veronica* his flower belongs, which, by further comparison, he finds to have all the characteristics of the species *Officinalis,* so that he has found out its real name, viz., *Veronica officinalis,* or the Common Speedwell.

Such is the simple process of discovering the name of any plant. There will, of course, be limitations and exceptions, but to describe them would be beyond our limits. Our purpose has been simply to show our objector, that his scruples are formed on a false basis; and we can assure any such, that if he would only adopt the plan we have laid down, he would find himself more than amply repaid for his trouble, by the gratification of his labours being crowned with success.

SINGULAR DWELLING OF A SPECIES OF MOTH,

WHILE UNDERGOING ITS METAMORPHOSIS.

THE following curious provision for the safety of the grub of a species of moth is described and figured by Mr. Curtis in the *Transactions of the Zoological Society of London.* The specimen was found in

Fig. 2.

Fig. 3.

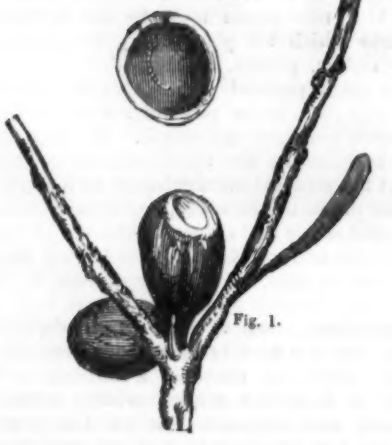


Fig. 1.

December, on a spot fifteen miles to the south of Monte Video, on the Rio de la Plata. The plant that bears the galls is a sort of underwood shrub, observed only in that part of the country, belonging it is supposed to a genus named *Celastrus.* The branch, fig. 1., shows the situation of two galls. They are frequently smaller, and sometimes five or six are clustered together, but never more than two appear to issue from one point. Those in the engraving are wrinkled, owing it is believed to their being in a young state when gathered. The galls arise where the attachment of leaves or flowers is indicated, and are therefore most probably produced by the transformation of the buds themselves. On the side of the gall is a round aperture, with an *operculum* (a little door) beautifully fitted to it, which may be easily picked out with the point of a penknife. (See fig. 2.) This operculum is equally convex with the rest of the gall, and is of the same thickness with it, but the diameter of the inside is less than that of the external surface, which forms a broader rim. Fig. 3 is a gall divided in two, to show its internal construction, and the situation occupied by the pupa, which is attached by its tail to the base, with its head close to the operculum, which of course gives way by the slight expansion or elongation of the pupa, when about to assume its winged state, and the skin is then left in the passage.

This curious provision of nature is rendered yet more singular from the fact that the gall-nuts we are acquainted with are generally caused by the operations of hymenopterous insects, many species of which are parasites on different kinds of plants.

In what way the operculum is formed, to fit so beautifully that there is little doubt, when the plant is alive, the place of opening would be with difficulty discovered, is a question that nothing but actual observation can solve. It may safely be inferred it is the operation of the caterpillar, since none of the galls wanted an operculum, and the existence of the dead pupa within them proves that it is not the work of the moth, and none of the butterfly or moth tribes have the power of biting, except in the caterpillar state. There is but one other instance known of a lepidopterous insect being the cause of a gall, and that apparently belonged to the same genus as the insect under consideration.

HAPPY the man who sees a God employed
In all the good and ill that chequers life.—COWPER.

CHILDISH, imbecile carelessness is enough to render any man poor, without the aid of a single positive vice.—WAYLAND.

WEALTH is not acquired, as many persons suppose, by fortunate speculations and splendid enterprises, but by the daily practice of industry, frugality, and economy: he who relies upon these means will rarely be found destitute, and he who relies upon any other will generally become bankrupt.—WAYLAND.

NEVER were the arts more nobly employed than by our forefathers, when they raised those beautiful piles, our Cathedrals, our Churches, our Universities, and our Abbeys, to the honour of that religion which God had given to man. It is lamentable to think how these majestic edifices fell before the blind zeal, the ill-directed means (however desirable the end), of the Reformation. A second havoc among ecclesiastical edifices, and scarcely less destructive than the first, arose from the fury of the fanatic and the miserable sectaries of the time of Charles the First.—Mrs. BRAY'S *Devonshire.*

. . . . . How full of cheer,
Joyous, devout, and grateful is the soul,
To see again its unexhausted God
Thus pile the table of a world with bread!
For what's the globe on which we all subsist?
The table of immortal bounty 'tis,
A feast perpetual, where unnumbered sons
Sit down to banquet as their sires withdraw,
And in succession generations feed,
Contented rise, give thanks, and pass away.—HURDIS.

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